

## Kepler's Laws Worksheet

Complete the following table.

Object	Mass (kg)	Semi-Major Axis (km)	Eccentricity	Semi-Minor Axis (km)	Aphelion (km)	Perihelion (km)	Period of Revolution	Radius of Object (km)	Acceleration of gravity	Escape Velocity	
Sun	$1.991 \times 10^{30}$								695,950		
Mercury	$3.181 \times 10^{23}$	$5.795 \times 10^7$	0.2056					2,433			
Venus	$4.883 \times 10^{24}$	$1.0811 \times 10^8$	0.0068					6,053			
Earth	$5.979 \times 10^{24}$	$1.4957 \times 10^8$	0.0167					6,371			
Mars	$6.418 \times 10^{23}$	$2.2784 \times 10^8$	0.0934					3,380			
Jupiter	$1.901 \times 10^{27}$	$7.7814 \times 10^8$	0.0484					69,758			
Saturn	$5.684 \times 10^{26}$	$1.4270 \times 10^9$	0.0543					58,219			
Uranus	$8.682 \times 10^{25}$	$2.8703 \times 10^9$	0.0460					23,470			
Neptune	$1.027 \times 10^{26}$	$4.4999 \times 10^9$	0.0082					22,716			
Pluto	$1.27 \times 10^{22}$	$5.909 \times 10^9$	0.2481					1137			

Some helpful information:

$$a = AQ$$

$$b = CQ$$

$$e = SQ/AQ$$

$$\text{Aphelion} = a(1+e)$$

$$\text{Perihelion} = a(1-e)$$

$$\text{Semi-minor axis} = a\sqrt{1-e^2} \quad T^2 = a^3 \quad 1 \text{ orbit} = 2\pi r \quad G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$$

$$F = GM_1M_2/r^2$$

$$F = mv^2/r$$

$$g = GM_p/r^2$$

$$\text{velocity of orbit} = \sqrt{GM_p/r}$$

$$\text{escape velocity} = \sqrt{2GM_p/r_p}$$

